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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/045,137	10/23/2001	Albert Z. H. Wang	NS-3868-1C US	3416

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EXAMINER

HU, SHOUXIANG

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 03/11/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/045,137

Applicant(s)

WANG ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 03 December 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 2,3,5-8,10 and 21-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2,3,5-8,10 and 21-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Claim Objections***

1. Claims 2, 3, 5-8, 10, 21 and 22 are objected to because of the following informalities and/or defects:

In claim 8 (the bottom four lines), the terms of "terminal A" and "terminal K" should read as --the terminal A--, and --the terminal K--, respectively.

In claim 21 (the bottom seven lines), the terms of "terminal A" and "terminal K" should read as --the terminal A--, and --the terminal K--, respectively.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 2, 3, 5-8, 10 and 21-30 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. These claims recite the subject matter(s) involving a coupling of terminal A—first current source—first resistor—terminal K and the coupling of terminal A—second resistor—second—terminal K, and/or the current sources each include a pair of back-to-back Zener diodes. These subject matters are

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apparently associated with the embodiments of Figs. 12-14. However, these associated embodiments are not enabled by the disclosure, because a current source as commonly recognized in the art is defined as an electrical power source that can supply a current at a fixed current level, just like a voltage source that can supply a voltage at a fixed voltage level, and the disclosure fails to describe: (1) how and by what means such a type of current sources can be activated (see page 18, lines 23-30); (2) how the current source can be formed of a pair back-to-back Zener diodes (see page 19, lines 13-26), given the fact that a diode itself can only serve as a voltage source (see page 20, lines 1-2); and (3) how the base of the bipolar transistor (130 or 150, Fig. 3) can be directly or equivalently connected to both of the current source (770 or 772) and the resistor (756 or 758), given the fact that the base region is a lightly doped region, which itself always has residual resistance when connected to the outside.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 23 and 24 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: the structure of the two-terminal dual-direction semiconductor device, since the instant invention as described in the original disclosure requires specific structure of a two directional semiconductor device in order to have the necessary coupling between the external circuits and the internal structure of the two directional semiconductor device.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 3, 5-8, 10 and 21-30, insofar as being in compliance with 35 U.S.C. 112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang et al. ("Huang"; 4,947,226) in view of Kim (5,844,280) and/or Jonassen (3,890,543).

Huang discloses a bi-directional switch structure (Figs. 4 and 5), comprising: A first semiconductor region (26, n+); a second semiconductor region (24, p); an electrically floating third semiconductor region (22, n); a fourth semiconductor region (25, p); and a fifth semiconductor region (27, n+); a first terminal A (33) is connected to the first and the second semiconductor regions; and a second terminal K (34) is connected to the fourth and the fifth semiconductor regions.

Huang does not expressly disclose that the bi-directional switch structure can be used in an ESD protection structure and that two power sources each including a pair of back-to-back Zener diodes in series with a resistor are connected in parallel to the two terminals.

However, one of ordinary skill in the art would readily recognize that such a bi-directional switch structure can be desirably used in an ESD protection structure for achieving bi-directional ESD protection, as evidenced in Kim (see Figs. 3 and 4). And, Jonassen discloses a voltage surge protection structure (Fig. 4) having a pair of back-

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to-back Zener diodes (13 and 14) in series with resistors (20 and 20') in parallel to the two terminal of the protection structure (11).

It would therefore have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate one or two pairs of Jonassen's back-to-back diodes in series with one or two resistors into the bi-direction switch structure of Huang and apply it is to an ESD protection structure, so that an ESD protection with improved time response and voltage imbalance conditions would be obtained, per the teachings of Kim and/or Jonassen.

Regarding claims 3 and 27, the bi-directional switch structure of Huang has an npnpn polarity, while the one in Kim has a pnpnp polarity. And, one of ordinary skill in the art would readily recognize that semiconductor devices designed with one polarity using an npnpn structure are also workable with the other polarity using a pnpnp structure. It is therefore well within the ordinary skill in the art to reverse the polarity of a device with the npnpn structure to form a device with the pnpnp structure for obtaining the desired device polarity.

Regarding claims 5-7 and 28-30, the third region in Huang includes an n-well in a p-type semiconductor substrate.

### ***Response to Arguments***

5. Applicant's arguments with respect to claims 1-3 and 5-10 have been considered but they are not persuasive.

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With respect to applicant's arguments regarding the claim rejections under 35 U.S.C. 112, it is noted that a current source is, as commonly recognized in the art, defined as an electrical power source that can supply a current at a fixed current level, similar to a voltage source such as a battery that can supply a voltage at a fixed voltage level. And, applicant fails to point out where the support for such a current source that can supply a fixed-level current to the switch structure's two terminals. The embodiment shown in Fig. 14 is critical to the enablement requirement of the instant invention, as the back-to-back Zener diodes shown there are the only example provided in the disclosure for forming the recited "current source". And, as admitted in the disclosure and the in applicant's argument that back-to-back Zener diodes themselves can provide a fixed voltage drop across the two terminals of the forward-biased diode therein, the back-to-back Zener diodes can only function as a voltage source for a circuit in parallel with them. The disclosure fails to show how the back-to-back Zener diodes themselves can function as current source that can provide a fixed level current to the in-series resistor. Furthermore, neither the disclosure nor applicant's arguments provide an adequate description about on what bases and/or how the connections depicted in Figs. 13 and 14 are not real connections but still equivalent to the connections depicted in Fig. 12.

In addition, with respect to applicant's argument that the applied references do not teach the claimed feature about the connections among the current sources, the resistors and the terminals, it is noted that, in view of the claim rejections under 35 U.S.C. 112, one of ordinary skill in the art would readily recognize that the two resistors (20 and 20' in Fig. 4) in Jonassen can be readily and equivalently replaced by a single

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resistor in series with and on either sides of the back-to-back Zener diodes, provided that the resistance of that single resistor equals to the sum of that of the two original resistors, and that an additional protection circuit of Zener diodes in series with a resistor can provide additional protection to the to-be-protected devices.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is (703) 306-5729. The examiner can normally be reached on Monday through Thursday, 7:30-AM to 6:00 PM.




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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

SH  
March 7, 2003

  
Shouxiang Hu  
Patent Examiner  
TC2800